

CLAIMS

1. A self-regulating hydrogen gas generator, for a hydrogen fuel cell, comprising:

5 a fuel tank, defining an inner space having a designated volume, provided with a hydrogen outlet communicating the inner space;

a fuel solution, containing a hydrogen storing material, stored in the fuel tank; and

a catalyst contacting the fuel solution for generating hydrogen gas,

10 wherein the catalyst fills a catalytic reactor, provided with a closed portion for interrupting the contact between the catalyst and the fuel solution to stop the generation of hydrogen gas in case that a pressure of the fuel tank increases due to the generation of hydrogen gas by the contact between the catalyst and the fuel solution, and an opened portion contacting the fuel solution for generating hydrogen gas in case that the
15 pressure of the fuel tank decreases due to the use of the generated hydrogen gas by the fuel cell, so that the generation and interruption of hydrogen gas are actively regulated based on the increase and decrease of the pressure of the fuel tank.

2. The self-regulating hydrogen gas generator as set forth in claim
20 1, wherein the catalytic reactor includes elastic means having a designated compressing and restoring force for moving the catalyst toward the closed

or opened portion, based on the increase and decrease of the pressure of the fuel tank due to the generation of hydrogen gas, to regulate the generation of hydrogen gas.

3. The self-regulating hydrogen gas generator as set forth in claim
5 2, wherein a catalyst-fixing member, provided with the catalyst connected thereto, which is movable in the catalytic reactor, is connected to one end of the elastic means.

4. The self-regulating hydrogen gas generator as set forth in claim
3, wherein fuel solution interception members, for preventing the fuel
10 solution from being introduced into the catalytic reactor through the opened portion when the catalyst-fixing member moves toward the closed portion due to the increase of the pressure of the fuel tank, are positioned at either of inner circumferences of the catalyst-fixing member and the catalytic reactor.

15 5. The self-regulating hydrogen gas generator as set forth in claim 3, wherein fuel solution interception members, for preventing the fuel solution from being introduced into the catalytic reactor through the opened portion when the catalyst-fixing member moves toward the closed portion due to the increase of the pressure of the fuel tank, are positioned between
20 the catalyst-fixing member and the elastic means.

6. The self-regulating hydrogen gas generator as set forth in claim 3, wherein the fuel tank includes gas-liquid separating means for separating the generated hydrogen gas from the fuel solution in a liquid state and exhausting the separated hydrogen gas to the outside.

5 7. The self-regulating hydrogen gas generator as set forth in claim 6, wherein:

an installation groove, into which the catalytic reactor from the outside is detachably inserted, is formed at a designated position of the fuel tank; and

10 the installation groove includes:

a through hole for allowing the catalyst of the catalytic reactor to contact the fuel solution of the fuel tank to generate hydrogen gas;

15 elastic means positioned on the bottom of the installation groove;

a through hole sealing member combined with the elastic means for sealing the through hole and pushing the catalyst-fixing member of the catalytic reactor connected thereto due to the increase of the pressure of the fuel tank to the through hole when the catalytic reactor is separated from the installation groove; and

a hydrogen generation regulating hole formed through the

bottom of the installation groove defining a closed space by the through hole sealing member for allowing the hydrogen gas generated in the fuel tank to enter into and leave the installation groove.

8. The self-regulating hydrogen gas generator as set forth in claim 5 7, wherein a gas-liquid separating film is installed in the fuel tank provided with the hydrogen generation regulating hole, and fixing means for fixing the catalytic reactor to the fuel tank is positioned at the end of the catalytic reactor and the entrance of the installation groove.

10 9. The self-regulating hydrogen gas generator as set forth in claim 8, wherein a catalyst exposure regulating portion for defining a sealed space is extended from the end of the catalytic reactor at the outer surface of the catalyst-fixing member, and another hydrogen generation regulating hole, which coincides with the hydrogen generation regulating hole when the catalytic reactor is inserted into the installation groove and regulates the 15 generation of hydrogen gas by moving the catalyst-fixing member based on the increase and decrease of the pressure of the fuel tank, is formed through a designated position of the catalyst exposure regulating portion.

20 10. The self-regulating hydrogen gas generator as set forth in any one of claims 6 to 9, wherein the gas-liquid separating means is a gas-liquid separating film having various shapes fixedly installed in the fuel tank so

that a designated space between the inner hole of the outlet and the fuel solution is defined to easily exhaust the hydrogen gas through the outlet.

11. The self-regulating hydrogen gas generator as set forth in claim 10, wherein an implant member provided with air holes, for preventing the movement of the gas-liquid separating film and efficiently exhausting hydrogen when the pressure in the fuel tank increases due to the generation of the hydrogen gas or the fuel tank moves, is interposed between the inner surface of the fuel tank and the gas-liquid separating film.

12. The self-regulating hydrogen gas generator as set forth in claim 11, wherein the gas-liquid separating film is a completely sealed type, which includes the catalytic reactor and the fuel solution and separates the outer surface thereof from the inner wall of the fuel tank by a designated interval.

13. The self-regulating hydrogen gas generator as set forth in any one of claims 6 to 9, wherein the gas-liquid separating means includes a collector floating on the fuel solution filling a designated level of the fuel tank, a collection hole protruded from the collector and exposed to the upper surface of the fuel solution for introducing the hydrogen gas generated in the fuel tank to the collector therethrough, and a drain hose connecting the other side of the collector, opposite to the collection hole, and the outlet, for exhausting the hydrogen gas collected by the collector.

14. The self-regulating hydrogen gas generator as set forth in any one of claims 3, 6 and 7, wherein the catalyst-fixing member includes:

both wings, formed at both ends thereof, sliding on the inner surface of a tube; and

5 a catalyst-fixing section interposed between the wings for fixing the catalyst.

15 15. The self-regulating hydrogen gas generator as set forth in claim 14, wherein a permanent magnet is attached to the catalyst-fixing section so that the catalyst made of metal is attached to the catalyst-fixing section using the permanent magnet without any separate process.

16. The self-regulating hydrogen gas generator as set forth in claim 14, wherein the catalyst-fixing section is divided into plural pieces for increasing a contact area between the catalyst and the fuel solution to generate a great amount of hydrogen gas.

15 17. The self-regulating hydrogen gas generator as set forth in claim 10, wherein the fuel tank includes hydrogen gas retaining means for converting hydrogen gas in a fine foam state, generated by the contact of the fuel solution and the catalyst, into large-sized hydrogen gas bubbles and allowing the obtained large-sized gas bubbles to pass through the gas-

liquid separating means.

18. The self-regulating hydrogen gas generator as set forth in claim 10, wherein the catalytic reactor is provided inside the hydrogen gas retaining means provided with a plurality of holes for converting hydrogen gas in a fine foam state, generated by the contact of the fuel solution and the catalyst, into large-sized hydrogen gas bubbles and allowing the obtained large-sized gas bubbles to pass through the gas-liquid separating means.

19. The self-regulating hydrogen gas generator as set forth in claim 10, wherein at least one collision member for preventing hydrogen gas in a fine foam state, generated in the fuel tank, containing moisture, from directly contacting the gas-liquid separating film, is interposed between the fuel solution and the gas-liquid separating film.

20. The self-regulating hydrogen gas generator as set forth in claim 10, wherein the fuel tank includes a hole for exhausting the waste fuel solution or its by-products from the fuel tank therethrough and for filling the fuel tank with a new fuel solution therethrough.

21. The self-regulating hydrogen gas generator as set forth in claim 10, wherein the fuel tank includes a vent hole for preventing the

overpressure of the fuel tank.

22. The self-regulating hydrogen gas generator as set forth in claim 14, wherein the catalyst, which is made of Raney Ni, is attached to a net or substrate in distilled water or general water using an adhesive agent, which
5 is solidified in the water without using a separate dry or surface oxidation process, and is then combined with the catalyst-fixing section.

23. The self-regulating hydrogen gas generator as set forth in any one of claims 2, 3, 6 and 7, wherein the elastic means includes a compressed coil spring.

10 24. The self-regulating hydrogen gas generator as set forth in any one of claims 2, 3, 6 and 7, wherein the elastic means includes compressible gas.

25. The self-regulating hydrogen gas generator as set forth in claim 10, wherein, in case that a plurality of spaces not-filled with the fuel solution
15 are divisionally obtained by respectively installing a plurality of the gas-liquid separating films at left, right, upper and lower portions, of the inside of the fuel tank filled with the fuel solution, a connection pipe connects the divided spaces, not-filled with the fuel solution, in the fuel tank.

26. The self-regulating hydrogen gas generator as set forth in claim 1 or 3, wherein a heating medium for generating heat is installed in at least one of the fuel tank, the catalytic reactor and the catalyst-fixing member.